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TESTS

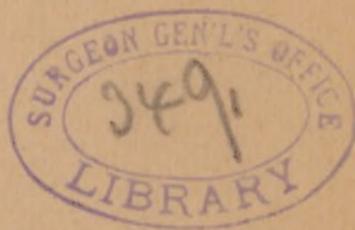
FOR

DIABETES MELLITUS

BY

PALMER C. COLE, A.M., M.D.

NEW YORK



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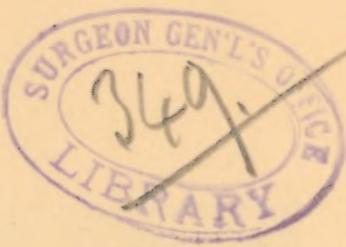
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TESTS FOR DIABETES MELLITUS.

By PALMER C. COLE, A M., M.D.,

NEW YORK.

PROFESSOR C. F. CHANDLER, of Columbia College, in 1874 brought from Berlin a modification of Fehling's test for the detection of grape-sugar in solutions, and determining the quantitative amount.

Dr. S. B. Ward, now of Albany, and myself, after long and carefully conducted experiments became convinced of its great superiority over any test with which we were then acquainted for the detection of grape-sugar in urine. In 1875 Professor Chandler read a paper on this test for sugar in urine before the New York County Medical Society, which, for some inexplicable reason, has remained ignored by the profession. Why a quantitative test so simple, so absolute, should be ignored by professors in Medical Colleges, and so far as I know, by all our text-books on urinary analysis, is difficult to account for.

Of all the tests for sugar Trommer's is the best known and most generally used by our profession. It is recommended in all the text-books, taught by all professors in our medical colleges and even by the professors in our polyclinics.

This test, so relied upon by the general practitioner (justified by the teaching of medical works and the lectures of those who should be a guide to the student), is untrustworthy.

It is untrustworthy for these reasons: Under certain circumstances, when urine contains grape-sugar, Trommer's test will fail to give the precipitation of suboxide or

hydrated suboxide. Under such circumstances it is judicious, according to Seegen, "to filter the urine through animal charcoal one or more times until it is completely decolorized, to wash the charcoal with a little distilled water, and to subject this water to Trommer's test, which then, provided the urine originally contained .05 per cent. of sugar, causes a precipitate of suboxide of copper."—Ziemssen's Cyclopædia, American edition, vol. xvi, pages 974 and 975.

Under certain circumstances Trommer's test will give indications of sugar where none exists in the urine. This might possibly be obviated by filtering through animal charcoal, though I have never tried the experiment. Under any circumstances the proceeding is tedious and may lead to fallacious results, as I think it possible that the very process to which we subject the urine may cause a trace of sugar to appear where none previously existed. How many practitioners who use Trommer's test ever observe the above precautions? How many even know of the necessity for their use?

As long ago as 1854 Golding Bird, "On Urinary Deposits," American edition, page 295, says, "Several objections have been made to this test on the ground that mere uric acid is sufficient to reduce the copper, and thus introduce a serious source of fallacy." I would add that, when in excess, creatinin, ammonia, and sometimes the coloring matter of the urine will prevent the finding of sugar when it is present.

For myself, I have been misled in previous years by finding by Trommer's test indications of sugar when probably none existed. My patients, after longer or shorter lapses of time, recovered. Knowing the ordinarily slow but sure progress of the disease, I was mystified, but concluded that diabetes mellitus was in some cases easily curable.

The modified Fehling's test showed me that the disease from which my patients recovered was probably not diabetes mellitus.

We have simple and infallible tests for the detection of grape-sugar in urine.

A test which, like Trommer's, may lead to fallacious conclusions should be expurgated from our text-books, and professors should cease to teach it to their pupils.

Fehling's test, if freshly prepared, may be relied upon. The one drawback to its use is its instability—on exposure to the air it deteriorates.

Professor J. C. Dalton obviated this defect by putting up the freshly prepared solution in half-ounce bottles, hermetically sealed, and opening a fresh bottle every time he made a test. Even with this precaution the test will sometimes decompose.

A modification of Fehling's test made up extemporaneously, perfectly trustworthy and reliable, uninfluenced by any of the normal or abnormal constituents of the urine, requiring no preliminary treatment of the urine (always an element of error), and by which a qualitative test can be made in five minutes, and a quantitative test in less than thirty minutes, is obviously superior. I am told that this test takes too much time to be applied by the busy professional man.

What professional man who takes an interest in his patients but can afford half an hour once or twice a week for the satisfaction of knowing absolutely their condition? The "differential density method" of Roberts, the fermentation test, the picric-acid test, as performed by Dr. Johnston, of London; the polariscopic test, and many others, all have sources of fallacy. The fermentative test is liable to these errors: In certain conditions of the urine it will fail to act when we know sugar is present. Again, the best prepared yeast, Fleischman's, will sometimes give us fermentation in water in which we know there is no sugar. The "differential density method" is liable to these errors and others. The precipitation of urates, earthy phosphates, and other changes not well understood lessen the specific gravity of the urine. As to the picric-acid test, our life insurance companies will not

accept it. The polariscopic test, while no more accurate than the "differential density method" of Roberts, requires an expensive instrument which few doctors possess.

The limit of this article prevents the consideration of other tests, as I consider my test superior to any other.

During the last twenty-five years I have devoted much time to the specialty of urinary diseases. I have never found any test for grape-sugar so absolutely free from error as the one I have recommended.

Dr. Ward and myself, in the course of our experiments, spent one afternoon in Professor Chandler's laboratory. We had met with a specimen of urine which, by Trommer's test, gave indications of sugar, but with my test did not give sugar, but a deep yellowish-green reaction. We asked Professor Chandler what caused it? He said, "He did not know, but it was not diabetes."

After many months of clinical investigation I arrived at a conclusion from which I have never seen cause to vary. This peculiar reaction indicated a pseudo-glycosuric condition of the system, perhaps analogous to diabetes mellitus, with this vital difference—it was curable.

Shortly after arriving at this conclusion I had occasion to verify it. A prominent physician of this city, knowing I had long been engaged in examination of urine, brought me a specimen of his own. He had been pronounced diabetic by some of the best authorities in New York, was nervous and anxious, thinking and saying he had but a short time to live. He was preparing to give up his practice and move to the country, which he shortly afterward did.

When he called to get my report, I was pleased to tell him that I could not find a trace of sugar in his urine; that he did not have diabetes mellitus, but was suffering from glycosuria, which was curable, and that he would get well. He did not believe me. I said to him, "Perhaps your urine may be temporarily free from sugar, give me another specimen in two or three days." He did so; same result. I asked for and obtained a third specimen a

week or ten days afterward, and again obtaining negative results I positively stated to him that he did not have diabetes mellitus and that he would recover.

He did not believe in my diagnosis or prognosis, and thinks to this day that he has recovered from a disease he never had.

I mention this prominent case as an illustration of the value of my test for diagnostic purposes.

Before proceeding further I would state that foods advertised as "Diabetic" are all, comparatively speaking, valueless, and so far as they advertise that they are absolutely free from starch, fraudulent.

With my test for the simple detection of sugar a large test-tube will suffice, but for a quantitative analysis the following simple and inexpensive apparatus is required : A retort stand, a few feet of rubber tubing, a Bunsen's burner, two or three Florence flasks of ten to twelve ounces capacity, one 100 c. ctm. flask, one 10 c. ctm. pipette, and a 25 c. ctm. burette graduated to tenths of a c. ctm.

The chemicals consist of, 1. A standard solution of sulphate of copper, C. P., 17.319 grams dissolved in 500 c. ctm. of distilled water. 10 c. ctm. of this solution will be reduced by .05 grm. of grape-sugar. 2. Caustic potash, C. P., one part dissolved in ten parts of distilled water. 3. Crystallized tartaric acid, C. P., pulverized. These reagents should be kept in ground-stoppered bottles.

All apparatus and C. P. chemicals can be obtained from Eimer & Amend, Eighteenth Street and Third Avenue.

The solutions are permanent. I prefer to make my own, and would advise others to do the same. With scales and metric weights and measures it is simple and easy.

To make the test solution : Take 10 c. ctm. of the copper solution, place it in a Florence flask and dilute with 40 c. ctm. of distilled water (Croton water filtered, or rain water filtered after boiling is pure enough for all practical purposes), add and dissolve without weighing, a small quantity (.66 grm. is sufficient) of tartaric acid, C. P. (the

only precaution to be observed is to use a sufficient quantity, which a few experiments will teach). Now add the potash solution until a deep and permanent blue is obtained. Place it on the retort stand to boil, for this test is only used while boiling. A spirit or kerosene lamp may be used instead of gas. The flask should be placed on a thin tin plate instead of wire-gauze to obviate smoking. It takes a few minutes longer to make the test but is safer.

This test is self-testing. If on boiling we get the slightest change of color, except, perhaps the intensification of the blue, we may rest assured that we have made some error in preparing our solution—our chemicals are impure, or our flasks are imperfectly cleansed. The solution, being worthless, must be thrown away and a fresh one prepared, which remains unchanged, before we proceed to test the urine.

After making a test, if sugar is found, the flask should be washed with eight or ten drops of nitric acid in a little water and then rinsed, to cleanse it from the precipitate of copper. While the test-solution is heating prepare the urine for analysis. Place 10 c. ctm. of the urine in the 100 c. ctm. flask, fill with water and mix. We have now urine diluted to ten per cent.

These dilutions are requisite for accuracy in quantitative analysis. Fill the 25 c. ctm. burette with the dilute urine. When the test-solution boils, add from the burette, drop by drop, until the blue is entirely discharged.

You have now a precipitate of the red suboxide of copper leaving the supernatant liquid clear. The reaction is *unmistakable*; no matter what other reactions urine may give with this test, if the characteristic reaction of the precipitation of the red suboxide is not obtained, we may rest assured that *there is no grape-sugar in the urine.*

To determine the per cent. of sugar we have this simple formula: c. ctm. of urine used : grams, of sugar found :: 100 : per cent. of sugar.

For example, say we have used from the burette 7.4 c. ctm., then, as the urine used was diluted to ten per cent., we place the decimal point one figure to the left, and find that in reality only .74 c. ctm. of urine was used. Now fill out the formula $.74 : .05 :: 100 : 6.756$ per cent. of sugar. The urine used in this experiment had a specific gravity of 1.036. Knowing the amount of urine passed in twenty-four hours, a very simple calculation will show the amount of sugar eliminated from the system by the kidneys in a given time. The test is simple, cleanly, and reliable. Its delicacy is so great that the earliest stages of diabetes can be detected with the utmost certainty.

Any careful observer can detect one part of grape-sugar in five thousand parts of urine, and an expert may detect one part of grape-sugar in twenty thousand parts of urine.

For the last thirteen years I have used no other test for grape-sugar (though I have experimented with many) and it has never failed. The claim I make as the result of clinical observations with this test is the ability to diagnose between a pseudo-glycosuric condition of the system which is curable, and diabetes mellitus, which we all regard with grave apprehension, and in its advanced stages must consider, though amenable to treatment, as incurable. I say in the advanced stages, for I have had two patients who came to me in the early stages of the disease and were apparently cured. One, after being under treatment for eighteen months, remained well for ten years. The other was under observation for about three years after all traces of sugar had disappeared. I have seen neither since. These are the only two cases of recovery I have to report in thirteen years. Many cases have been reported as typical cases of diabetes mellitus cured, which, from their published histories I should call glycosuria.

I should class the conditions we have been considering, under three heads :

First, Pseudo-glycosuria. We are now unable by any known test to detect sugar, but have well-defined indications that serious changes are going on in the assimilative organs. Second, Glycosuria. We have now greater changes in the assimilative organs, but their perverted action has not yet become habitual. Sugar appears and disappears from time to time, owing to causes partly dietetic. Third, True Diabetes Mellitus. Now the perverted action of the assimilative organs has become habitual, and sugar in varying amount is constantly found in the urine.

These three conditions can be clearly diagnosed.

The first two, pseudo-glycosuria and glycosuria, as a rule, yield to dietetic and hygienic treatment. I place but little confidence in drugs in the treatment of this disease. The third, true diabetes mellitus, if recognized in the early stage, when the amount of sugar is small, though persistent, may yield to treatment; but if it does not come under observation until the advanced stage has been reached, must, as I have before said, be regarded, though amenable to treatment, as incurable.

